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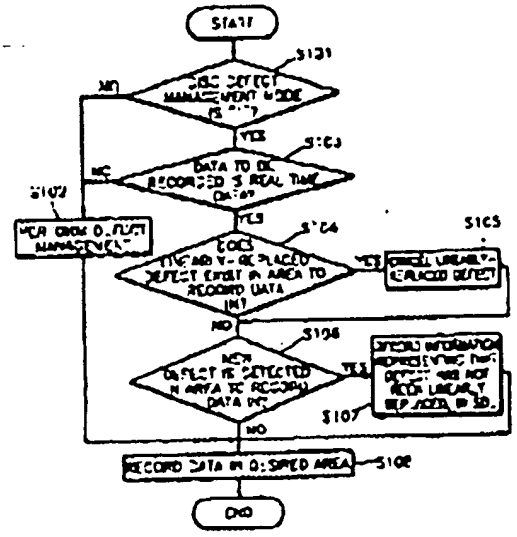
Recording medium for storing defect management information for recording real time data, defect managing method therefore, and real time data recording method

A recording medium for storing defect manage- nformation to record real time data, a defect man- method therefor, and a method of recording real ata, are provided. The recording medium stores ation representing use or non-use of linear re- nent defect management in which a defective ar- the recording medium is replaced with the spare area, in order to record real time data. While maintaining compatibility between the defect managing method and a defect managing method based on a current DVD-RAM standard, i.e., while allowing report of the fact that there are blocks which have not been linearly replaced, linear replacement is not performed when real time data is recorded. Thus, real time data can be recorded and reproduced.

FIG. 9



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The present invention relates to the field of ng a disk and its defects, and more particularly, cording medium for storing defect management tion with respect to whether linear replacement , a method of effectively managing defects to and/or reproduce video and/or audio data from d versatile disc random access memory (DVD- n real time, and a method of recording data in e using defect management information.

Real time recording or reproduction means given amount of data is necessarily recorded or uced within a given time since input information f it is not processed at the moment data is input, ce a phenomenon such as pause of an image or ary interruption of music occurs with reproduc- data as abnormal information if data is not record- eproduced at a predetermined speed. The above- ced problems are caused since the input of infor- cannot be temporally controlled by a recording producing apparatus.

] In the DVD-RAM standard version 1.0, a meth- managing defects generated on a disk has been ed to increase the reliability of data recorded on sk. Slipping replacement and linear replacement cluded as the disclosed defect management meth- e first method processes defects detected in an zing process; and the second method replaces an correction code (ECC) block unit (16-sector unit) ing a sector having a defect generated during use disc with a defect-free ECC block in a spare area.

] The slipping replacement is used to minimize uction in the recording or reproduction speed due ects, in which a logical sector number to be pro- to a defective sector is provided to a sector next defective sector detected during a certification s for investigating defects of a disc when the disc ialized, that is, data is recorded or reproduced by ng a sector on which a defect is generated during ing or reproduction. Here, a real physical sector or is pushed back by the sector number designat- slipping the defective sector. Such a left-behind omenon is solved by using as many sectors as are defects in a spare area located at the end por- a corresponding recording area.

] However, the slipping replacement cannot be for a defect generated while a disc is used. When ective portion is disregarded and skipped, discon- is generated on logical sector numbering, which s that the slipping replacement violates file system . Thus, the linear replacement is used when a de- generated during use of the disc, which means placement of an ECC block including a defective with an ECC block existing in a spare area.

] When the linear replacement is used, no vac- exists in a logical sector number, however, the po- of a sector on a disc is discontinuous, and real data corresponding to a defective ECC block exists in the spare area.

[0007] As described above, when real time recording, in which the time for temporarily-input information cannot be arbitrarily delayed, such as, recording of broadcast information or a real image, is necessary, information is recorded in an area to be linearly-replaced by undergoing a process in which a real pickup goes up to the spare area and searches for an area to be linearly replaced, and a process in which the real pickup comes back. Hence, the recording speed is reduced, so that information input in real time cannot be continuously recorded when the linear replacement is used.

[0008] It is prescribed that a DVD-RAM drive according to the DVD-RAM standard version 1.0 processes all of this defect management to reduce the burden of the host computer used in the drive. The host computer is designed to transmit a command ordered not to manage defects to the drive using a command denoted in an interface standard. That is, if the host computer determines whether defect management will be performed, the defect management itself is supposed to be performed by the drive.

[0009] Even when the host computer does not manage defects according to the need of an application program, the DVD-RAM disc according to the DVD-RAM standard version 1.0 must necessarily manage defects recorded in a primary defect list (PDL) and a secondary defect list (SDL) according to a defect management rule if an area slipping replaced or linear replaced due to defect management performed by another drive exists. Here, it is prescribed that the position of a defective sector replaced according to slipping replacement should be recorded in the PDL, and the position of a defective block replaced according to linear replacement should be recorded in the SDL. That is, when data is recorded after setting the fact that a specific drive should not perform defect management using the linear replacement, it cannot be ensured that other drives must also not perform the linear replacement on the same disc.

[0010] Therefore, when real time recording is performed by a current DVD-RAM disc, it may be difficult because of an area to be used by the linear replacement.

[0011] With a view to solve or reduce the above problems, it is an aim of embodiments of the present invention to provide a recording medium for storing defect management information associated with whether linear replacement is used or not, to record real time data.

[0012] It is another aim to provide a recording medium for storing information for showing a plurality of different defect management modes according to the type of data to be recorded.

[0013] It is still another aim to provide a recording medium for allocating a spare area for only real time recording whose space can be effectively utilized.

[0014] It is yet another aim to provide a method of managing a defect of a recording medium which can

eal time data and can have maximum compati- h a general DVD-RAM disc.

It is still yet another aim to provide a method ding real time data using the defect manage- ormation associated with whether the linear re- ent is used.

According to a first aspect of the invention, provided a recording medium including a record- a and a spare area, for storing information rep- g use or non-use of linear replacement defect ement in which a defective area on the recording n is replaced with the spare area.

Preferably, the information representing use or e of linear replacement contains information as- d with the entire recording medium.

The information representing use or non-use ar replacement preferably contains information ated with parts of the recording medium.

The recording medium may be a disc desig- by a digital versatile disc (DVD) standard.

The recording medium may be a DVD-RAM signated by a DVD-RAM standard.

The information representing use or non-use ar replacement is preferably recorded in a re- area of a disc certification flag and a group cer- n flag in a disc definition structure (DDS) provid- the DVD-RAM.

The information representing use or non-use ar replacement is preferably stored upon initiali-

The information representing use or non-use of replacement may be stored just before recording al time data.

Preferably, only the start sector number of a having a defect generated while real time data is ded on the recording medium is recorded in a sec- y defect list (SDL). Information representing that defective block has not been replaced is recorded RM bit of an SDL entry for representing replace- or non-replacement of the defective block, and in- tion representing non-replacement is recorded in art sector number of a replacement block of the ntry.

Information representing that linear replace- has been canceled may be further stored in a re- d bit of the SDL entry. Information representing e defective block has been replaced is stored in RM bit of the SDL entry, and the start sector er of the defective block and that of the replace- block are stored in the SDL entry.

The information representing use or non-use ar replacement preferably includes information senting that linear replacement is applied with re- to every data on a recording medium, information senting that linear replacement is selectively ap- according to the type of data, and information rep- ting that linear replacement is not applied to every n the recording medium, and this information is d in the reserved area of the DDS.

[0026] When real time data is recorded, a spare area for linear replacement is preferably not allocated, and only a spare area for slipping replacement is allocated.

[0027] The spare area for slipping replacement is preferably allocated in the last group of the recording medium by the size of sectors capable of processing a maximum number of entries capable of registering a primary defect list (PDL).

[0028] Preferably, information representing use or non-use of linear replacement, denoting use of a defect managing method for only real time recording in which linear replacement is not used by allocating only the spare area for slipping replacement, is stored in a reserved area of the DDS and the PDL.

[0029] According to a second aspect of the invention, there is provided a recording medium for storing defect management mode information for showing a plurality of defect management modes representing use or non-use of linear replacement according to the type of data to be recorded.

[0030] The defect management mode information may be stored in a reserved area of the DDS of a defect management area (DMA).

[0031] The defect management mode information preferably includes first defect management mode information representing that slipping replacement and linear replacement are applied to every data on the recording medium, second defect management mode information representing that linear replacement is selectively applied according to the type of data, and third defect management mode information representing that linear replacement is not applied to every data on the recording medium.

[0032] According to a third aspect of the invention, there is provided a recording medium for storing information representing non-application of linear replacement to all data on the recording medium in a defect management area, in which only a spare area for slipping replacement is allocated.

[0033] The defect management area is preferably a reserved area in the DDS and the PDL, and the spare area for slipping replacement can process a maximum number of entries capable of registering the PDL.

[0034] According to a fourth aspect of the invention, there is provided a defect managing method for a disc recording and/or reproducing apparatus, comprising the steps of:

(a) recording information representing use or non-use of linear replacement defect management with respect to the entire disc or a specific area of a disc; and

(b) determining whether a defective area will be replaced by a block in a spare area using linear replacement according to information representing use or non-use of the linear replacement defect management.

Preferably, in step (a), information represent- e or non-use of linear replacement for the entire recorded in a reserved area of a disc certification the DDS provided by the DVD-RAM.

Preferably, in step (a), information represent- e or non-use of linear replacement for the specific f the disc is recorded in a reserved area of a group ation flag in the DDS provided by the DVD-RAM.

Preferably, in step (a), the information repre- g use or non-use of linear replacement is recorded initialization of the disc. Alternatively, the informa- presenting use or non-use of linear replacement e recorded just before real time data is recorded disc.

] The information representing use or non-use ar replacement is preferably information for show- plurality of defect management modes, and this nation is recorded in a reserved area of the DDS.

] Preferably, the information showing the plural- defect management modes includes information senting that slipping replacement and linear re- ment is applied with respect to all data on the re- ng medium, information representing that linear re- ment is selectively applied according to the type of and information representing that linear replace- is not applied to all data on the recording medium.

] The information representing use or non-use ear replacement preferably denotes the use of a t managing method dedicated for real time record- which linear replacement is not performed by al- ing only a spare area for slipping replacement.

] The spare area for slipping replacement may located to the last group of a disc, and the informa- representing use or non-use of linear replacement rded in the reserved area of the DDS and the PDL.

] Preferably, in step (b), when the information senting use or non-use of linear replacement rep- nts the non-use of linear replacement, linear re- ment is not used for real time data, but linear re- ment is used for data other than real time data.

] In step (b), when the information representing or non-use of linear replacement represents the use of linear replacement, linear replacement is arably not used regardless of whether data is real data.

] The defect managing method may further prise the step of: (c) canceling the linear replace- t of a defect on an area where real time data is to ecorded, when the information representing use or use of linear replacement represents the non-use ear replacement.

] In step (c), the linear replacement may be can- d using a flag representing that the linear replace- t has been canceled using a reserved bit in an SDL. rmation representing that a defective block has been aced is preferably stored in an FRM bit of the SDL y, and the start sector number of the defective block the start sector number of a replacement block may be stored in the SDL entry.

[0046] In step (c), preferably only the start sector number of a defective block is left in an SDL information representing that a defective block has not been replaced is stored in an FRM bit of the SDL entry showing whether the defective block has been replaced, and information representing that the defective block has not been replaced is stored in the start sector number of a replacement block are stored in the SDL entry.

[0047] The defect managing method may further comprise the step of: (d) recording only the start sector number of a block having a defect generated while using a disc on which information that the linear replacement defect management will not be used has been recorded, in an SDL, recording information representing that a defective block has not been replaced in the FRM bit of the SDL entry showing whether the defective block has been replaced, and recording information that the defective block has not been replaced in the start sector number of a replacement block in the SDL entry.

[0048] The defect managing method may further comprise the step of: (e) performing defect management based on linear replacement when a defect is generated during use of a disc on which information that the linear replacement defect management will be used has been recorded.

[0049] According to a fifth aspect of the invention, there is provided a method of recording real time data while managing a defect on a disc using a disc recording and/or reproducing apparatus, the method comprising the steps of: (a) determining whether defect management mode information representing whether defect management based on linear replacement will be used; (b) determining whether data to be recorded is real time data, when the defect management mode information is information that the linear replacement will not be used; (c) determining whether a linearly-replaced defect exists in an area to record data in, when the data to be recorded is real time data; and (d) determining whether a new defect is detected in the area to record data in, when no linearly-replaced defect exists in the area to record data in, and recording the real time data in a desired area when the new defect is not detected.

[0050] The method of recording real time data may further comprise the steps of: (e) performing defect management when the defect management mode information is information representing that the linear replacement will be used, in step (a); and (f) performing defect management when data to be recorded is not real time data in step (b).

[0051] The method may further comprise the step of: (g) canceling linear replacement when a linearly-replaced defect exists in an area to record data in, in step (c).

[0052] Preferably, in step (g), only the start sector number of a defective block is left in the SDL. Information representing that the defective block has not been replaced is stored in an FRM bit of the SDL entry show-

ther the defective block has been replaced, and tion representing that the defective block has not placed is recorded in the start sector number of cement block in the SDL entry.

Preferably, in step (g), a flag representing that placement has been canceled is set using a re- bit of the SDL entry, information representing lefective block has been replaced is stored in an it of the SDL entry, and the start sector number defective block and the start sector number of a ument block are recorded in the SDL entry.

The method may further comprise the step of: ording information representing that linear re- nent has not been performed, when a new defect cted in step (d).

Preferably, in step (h), only the start sector r of a defective block is left in the SDL, informa- presenting that the defective block has not been ed is stored in an FRM bit of the SDL entry show- ether the defective block has been replaced, and ation representing that the defective block has not replaced is recorded in the start sector number of acement block in the SDL entry.

] The defect management mode information e information representing use or non-use of lin- placement for the entire disc, and is stored in a ved area of a disc certification flag in a DDS pro- by DVD-RAM. Alternatively, the defect manage- mode information may be information represent- e or non-use of linear replacement for some data s of the disc, and stored in a reserved area of a certification flag in a DDS provided by DVD-RAM.

] The defect management mode information nably includes information representing that slip- eplacement and linear replacement are applied to ta on a disc, information representing that linear cement is selectively applied according to the type a, and information representing that linear replace- is not applied to all data on the disc, and this in- ation is stored in a reserved area of a DDS provided VD-RAM.

] The defect management mode information be information representing the use of a defect aging method for only real time recording in which r replacement is not used by allocating only the e area for slipping replacement, and is stored in a ved area of a DDS provided by DVD-RAM and the

] For a better understanding of the invention, o show how embodiments of the same may be car- into effect, reference will now be made, by way of nple, to the accompanying diagrammatic drawings, ich:

Figure 1 is a view for explaining a defect manage- ment method using slipping replacement of a re- cording medium;

Figure 2 is a view for explaining a defect manage- ment method using linear replacement of a record- ing medium;

Figure 3 is a table of a defect definition structure (DDS);

Figures 4A and 4B illustrate the structures of the disc certification flag and the group certification flag shown in Figure 3, respectively;

Figure 5 is a table of the contents of a secondary defect list (SDL);

Figure 6 illustrates the structure of the spare area full flag shown in Figure 5;

Figure 7 illustrates the structure of the SDL entry shown in Figure 5;

Figures 8A and 8B illustrate the structures of the disc certification flag and the group certification flag of the DDS for recording real time data proposed by embodiments of the present invention, respectively;

Figure 9 is a flowchart illustrating an embodiment of a method of recording data according to a defect management method of the present invention;

Figure 10 illustrates an example of the structure of an improved SDL entry for canceling linear replace- ment as proposed by the present invention;

Figure 11 illustrates an example of a DDS for storing information for indicating a plurality of different de- fect management modes proposed by the present invention;

Figure 12 is a table showing allocated spare areas for recording real time data as proposed by embod- iments of the present invention; and

Figure 13 illustrates a DDS and the structure of a primary defect list (PDL) for storing defect manage- ment mode information as proposed by embodi- ments of the present invention for allocating the spare areas for only real time recording shown in Figure 12.

[0060] Preferred embodiments of a recording medium storing defect management information for recording real time data, a defect managing method using the same, and a real time data recording method will now be de- scribed with reference to the attached drawings.

[0061] First, slipping replacement and linear replace- ment will be described in detail referring to Figures 1 and 2 in order to help in the understanding of the present invention.

Figure 1 is a view for explaining a defect man-
nt method using the slipping replacement. Phys-
dresses on a disc shown in Figure 1 are recorded
P2, P3, ..., Pn, and logical addresses must be
ed to record real data in this physically-segment-
tor. These logical addresses act as addresses al-
a real file system to search for its own data. How-
the relationship between the physical addresses
e logical addresses is made in a disc initialization
s. If a defect is detected on the third physical sec-
as shown in Figure 1, a logical address is not des-
d to this defective sector, and a logical sector
r L3 is designated to the next physical sector P4.
the logical sectors are sequentially pushed back
number of defective sectors, and a spare area
d at the end of a corresponding data group is used
e pushed portion. In this slipping replacement
od, effective processing in sector units is possible
ply slipping a defective region, and a pickup does
ed to move to a different place upon recording and
duction by simply disregarding and slipping a de-
e portion. Thus, the defective region can be avoid-
ile minimizing the delay time. Here, the position of
ective sector replaced by the slipping replacement
orded in the PDL.

3] Figure 2 is a view for explaining a defect man-
ment method using linear replacement. In the linear
cement for processing defects generated while a
s used after being initialized, the defects are man-
in an ECC block unit, i.e., in units of 16 sectors. In
words, when an error is generated at a specific
r and a defect is thus detected, if the movement in
of at least 16 sectors is not made for error correc-
the error correction unit of each data previously re-
d in a disc must be changed. Thus, processing in
CC block unit must be performed, and the slipping
cement method of slipping a defective sector and
gnating a logical sector cannot be used since the
al address of an area where data has already been
rded cannot be changed. When a defect is gener-
in a logical block LB2 as shown in Figure 2, the
ctive region is recorded in the SDL to be prevented
being used, and the defective portion is replaced
a usable block existing in a spare area. The re-
ed block (SBk in Figure 2) in the spare area has the
a logical block number (LB3) as the erroneous
r.

4] In a reproduction sequence, as shown in Fig-
2, reading is continued just before to a defective
k as in an area 1, a replaced ECC block existing in
spare area is read by moving a pickup or the like as
area 2, and data is continuously read from a block
next to the defective block as in an area 3. In order
ocess defects as described above, pickup move-
l is caused such as a process for searching for data
a process for returning to the block right next to the
ctive block after reading the replaced block. Thus,
h time is required to read or write data, so that this
defect management is not appropriate for real time re-
cording.

[0065] Figure 3 is a table of a disc definition structure (DDS) existing in a defect management area (DMA) of a DVD-RAM. In particular, a byte position (BP) 3, a disc certification flag, records the certified contents of the entire disc, and BPs 16 through 39, group certification flags, record the contents of certification of 24 data groups.

[0066] In addition, BPs 0 and 1 are DDS identifiers, and BPs 4 through 7 are the values of counters for updating DDS/PDL representing the total number of times in which a DDS/PDL block is updated and rewritten. That is, when initialization starts, the value of a counter is set to be "0", and increases by one whenever the DDS/PDL is updated or rewritten. All DDS/PDL and SDL blocks must have the same counter value after formatting is completed. BPs 8 and 9 denote the number of groups, and, for example, 24 groups are recorded as "0018" (hexadecimal).

[0067] Figure 4A illustrates the structures of the disc certification flag shown in Figure 3. When a bit b7 among three bits b7, b6 and b5 representing an in-process state is "0b", it indicates format completion, and when the bit b7 is "1b", it indicates an under-formation state. When the bit b6 is "0b", it indicates the progress of formatting using full certification, and when the bit b6 is "1b", it indicates the progress of formatting using partial certification. When the bit b5 is "0b", it indicates the progress of formatting on the entire disc, and when the bit b5 is "1b", it indicates the progress of formatting on only groups, and indicates that the group certification flag is effective. When a bit b1 representing user certification is "0b", it indicates that a disc has never been certified by a user, and when the bit b1 is "1b", it indicates that a disc has been certified one or more times by a user. When a bit b0 representing disc manufacturer certification is "0b", it indicates that a disc has never been certified by a manufacturer, and when the bit 0 is "1b", it indicates that the disc has been certified one or more times by the manufacturer. Other bits b4, b3, and b2 are reserved. However, "in-process" is set to be "1xx" by any certification before formatting, and when formatting is completed, the "in-process" is reset to be "000".

[0068] Figure 4B illustrates the structure of each of the group certification flags of the bit positions 16 through 39 shown in Figure 3. When a bit b7 among two bits b7 and b6 representing an in-process state is "0b", it indicates format completion of a corresponding group, and when the bit b7 is "1b", it indicates that the corresponding group is being formatted. When the bit b6 is "0b", it indicates that the group is being formatted using full certification, and when the bit b6 is "1b", it indicates that the group is being formatted using partial certification. When a bit b1 representing user certification is "0b", it indicates that the group has never been certified by a user, and when the bit b1 is "1b", it indicates that the group has been certified one or more times by a user.

bits b5, b4, b3, b2, and b0 are reserved.

Figure 5 is a table showing the contents of a ...tary defect list (SDL). RBP is the position of a re... byte starting with 0. Relative byte positions 0 and ... SDL identifiers, and relative byte positions 2 and ... reserved. Relative byte positions 4 through 7 de... he total number of updated SDL blocks, and SDL ...ing counter value increases by one whenever the ...nt of SDL is updated. Relative byte positions 8 ...gh 15 denote spare area full flags, and relative byte ...ons 16 through 19 denote DDS/PDL updating ...er values each indicating the total number of times ...DS/PDL block is updated and rewritten. The coun... value is set to be "0" when initialization starts, and ...eases by 1 whenever the DDS/PLD is updated or ...ften. As mentioned above, all the DDS/PDL and ...blocks must have the same count value after for... ng is finished. Relative byte positions 20 and 21 ...eserved, and relative byte positions 22 and 23 in... e the number of entries in the SDL. The remaining ...ive byte positions indicate each SDL entry.

[0] Figure 6 illustrates the structure of the spare ...full flag of the relative byte positions 8 through 15 ...m in Figure 5. In Figure 6, if a bit representing a ...sponding group is "1", it indicates that no spare ...ks are left in the corresponding group, and if the bit ..., it indicates that a spare block remains in the cor... ...onding group.

[1] Figure 7 illustrates the structure of the SDL en... shown in Figure 5. In Figure 7, FRM is a bit repre... ...ing whether a defective block has been replaced. ...n the defective block has been replaced, FRM ...rds a binary "0", and when the defective block has ...been replaced or no spare areas exist, FRM records ...nary "1". The SDL entry includes the sector number ...e first sector of a defective block, and the sector ...ber of the first sector of a replacement block. Here, ...a defective block has not been replaced, a hexadeci... "000000" is recorded in an area where the first sec... number of the replacement block is recorded.

[2] Meanwhile, in real time recording, whether cor... ...onding data can be processed within a given time ...omes more important than some errors of real data. ...articular, in the case of an image or the like, an error ...enerated to part of a screen when a small error exists ...e image. On the other hand, when input data cannot ...processed in time, continuous data error is generated ...make normal reproduction impossible. Therefore, the ...cessing of data in time is more important.

[3] Thus, as for the real time recording, a method ...wing non-use of the linear replacement must be sug... ...ted. When the linear replacement is not used, there ...st be a portion recording the fact that a corresponding ...c is in use without using the linear replacement. A ...thod of recording such a content will be described ...rring to Figures 8A and 8B.

[4] Figures 8A and 8B illustrate the structures of ...disc certification flag and the group certification flag of the DDS proposed by the present invention to record real time data, respectively. The structures of the disc certification flag and the group certification flag of Figures 8A and 8B are the same as those of Figures 4A and 4B except for a bit position b2. That is, as shown in Figure 8A, when the entire corresponding disc is used without the linear replacement, the bit position b2 of the disc certification flag is set as "1", and when the corresponding disc is used by the linear replacement as in the prior art, the bit position b2 is set as "0". In Figures 8A and 8B, information associated with use or non-use of the linear replacement stored in the bit position 2(b2) is called a disc defect management mode.

[0075] Also, when only specific groups are partially initialized to prevent the linear replacement, as shown in Figure 8B, the bit position 2(b2) of the group certification flag for a corresponding group is set as "1" to indicate that linear replacement is not performed on a data region in the corresponding group. In an embodiment of the present invention, the bit positions 2(b2) of the disc certification flag and the group certification flag are used as shown in Figures 8A and 8B, but another reserved bit can be used. Here, each existing b2 region is reserved, and its value is recorded as "0".

[0076] When the bit b2 for a disc defect management mode of the disc certification flag or group certification flag is set as "1" upon initialization of a disc, the SDL records only the start sector address of a block having a defect generated during use of the disc, records an FRM bit of the SDL entry as "1", and the linear replacement is not performed. A hexadecimal "000000" is recorded in an area for recording the first sector number of a replacement block of the SDL entry.

[0077] In this way, while compatibility between a defect managing method based on a current DVD-RAM standard and a method of the present invention is maintained, i.e., while a method capable of indicating the existence of nonlinearly-replaced blocks as in an existing defect managing method is suggested, a method allowing a defective block not to be linearly replaced is also provided to thereby accomplish recording and reproduction of real time data.

[0078] A determination of whether a defective region will be replaced by a block existing in a spare area using linear replacement is made by information associated with use or non-use of linear replacement defect management recorded in a defect management region on the entire disc or a specific area of the disc regardless of the type of data to be recorded in a corresponding area.

[0079] Also, a determination of whether a defective region will be replaced by a block existing in a spare area using the linear replacement is made by information associated with use or non-use of linear replacement defect management recorded in a defect management region on the entire disc or in a specific area on the disc in the case of only data required to be recorded in real time.

] A method of preventing linear replacement respect to the entire disc or a specific group of discs scribed on the basis of the above-described emment. In another embodiment, when a disc defect gement mode is set as "1", it can be used as inion that the linear replacement is not performed respect to a block having a defect in an area of a or recording information requiring real time recordnd reproduction, but the linear replacement can be rmed with respect to an area of a disc not requiring ime recording. In this case, when data not requiring time recording has already been recorded in an ar- which real time data must be recorded, and a de- e region is thus linearly replaced, the linear reement of the defective region must be capable of g canceled. Therefore, when the disc defect mannent mode is set as "1", this can mean that the linear acement of the defect can be canceled when real information is recorded.

1] In order to prevent entire linear replacement respect to the entire disc or a given group on the , information associated with the disc defect manment mode is set as "1" upon initialization. On the r hand, when linear replacement is not performed in the case of recording real time data, there is no d to set the defect management mode information n initialization. That is, when it is determined that e is a necessity for recording real time data in a disc, disc defect management mode is set as "1" just be- the real time data is recorded. At this time, a determination of whether a corresponding disc is suitable for ording real time data is made on the basis of the ount or distribution of a defect generated on the disc. an it is determined that the disc is suitable, the disc ect management mode is set as "1". Otherwise, a cess for informing a user that the disc is not suitable recording real time data is required.

82] Figure 9 is a flowchart illustrating a method of ording data in real time without performing defect nagement using linear replacement with respect to / data desired to be recorded when the disc defect nagement mode is "1".

83] In Figure 9, first, a determination of whether a defect management mode is "1" is set before recording of data on a disc begins. In step S101. If the disc ect management mode is "1", it is determined whether data to be recorded is real time data, in step S103. If defect management mode is "0", every data is recorded on the basis of a general defect managing method defined in the standard book version 1.0, in steps 02 and S108. When it is determined in step S103 that a to be recorded is not real time data, step S102 of forming general defect management is performed. hen it is determined in step S103 that data to be recorded is real time data, it is determined whether an already-linearlyreplaced defect exists in an area where a is to be recorded, in step S104.

84] When it is determined in step S104 that the linearly-replaced defect exists in the area to record data in, the linearly-replaced defect is canceled, in step S105. When no linearly-replaced defect exists in the area to record data in, it is determined whether a newly-detected defect exists in the area to record data in, in step S106.

[0085] When it is determined in step S106 that a new defect is detected, information representing that a defect has not been linearly replaced is recorded in a secondary defect list (SDL) of a defect management area, in step S107. Next, data is recorded in a desired area in step S108. Also, when a new defect is not detected in step S105, step S108 of recording real time data in a desired region is performed.

[0086] Step S105 of canceling a linearly-replaced defect, and step S107 of recording information representing that a defect has not been linearly replaced are performed by recording the first sector number of a replacement block as a hexadecimal "000000", among linearly-replaced defect information recorded in the SDL, and by recording the FRM information as "1". In this case, since the disc defect management mode is set as "1", it can be recognized from the comparison of this mode information with FRM information that the meaning of the FRM information becomes different from that of existing FRM information.

[0087] That is, the FRM information based on the existing standard book denotes that a block having a defect generated for a certain reason has not been replaced with a block in a spare area or no spare areas can be replaced. On the other hand, FRM information based on a new definition is added to the meaning of the existing FRM and can be information representing that when the disc defect management mode is "1", the linear replacement of a defective block replaced by an existing linear replacement method has been canceled for real time recording, or the defective block has not been linearly replaced for real time recording.

[0088] Since a disc whose defect management mode is set as "1" is likely to include real time information, the disc can be utilized as information of prohibiting reallocation of information on a disc without consideration of real time information. Place collection of collecting the places of a file on a disc, and read after reallocation can be included as a method of reallocating the information on a disc. The read after allocation is a method of reading data and then replacing a data block likely to have a defect with a block located in a spare area.

[0089] Figure 10 illustrates the structure of an improved SDL entry for canceling linear replacement proposed by the present invention. When an already-replaced defect exists on a corresponding disc upon recording of real time data, a method of recording the information of an area, in which the first sector number of the replacement block as described above is recorded, as a hexadecimal "000000" and setting an FRM bit as "1" is accomplished as a process for canceling the linear replacement.

3] This method can minimize the change in the ng standard. However, in this method, the informa- of a block which is determined as defective and re- ed must be deleted, so that linear replacement may bitrarily performed, canceled, and again performed out sequentially using a spare area. In particular, n a linearly-replaced block in the spare area is de- ve and again replaced, information associated with linearly-replaced defective block in the spare area st.

1] Thus, it would be preferable that blocks in a esponding spare area are sequentially used when r replacement occurs, and that even when the lin- replacement is canceled, information associated a block in the spare area replacing a corresponding ct block is maintained. When only a region record- an FRM bit and the first sector number of a replace- t block is used to maintain information associated the replaced sector number of the spare area, it is possible to tell if the corresponding replaced block again been replaced on account of a defect or if the ar replacement has been canceled to record real data.

2] In order to solve such a problem, a canceled ar replacement (CLR) flag is newly defined by using pare bit of the SDL entry which is not in use. When ar replacement with respect to a corresponding SDL ry is canceled for recording real time data, a method etting the CLR flag as "1" can be used. Here, when CLR flag is set as "0", it indicates a replacement ck allocated without being used by real time data. In structure of an SDL entry of Figure 10, for example, bit bS1 not in use is used as the CLR flag.

3] Meanwhile, defect management information recording real time data can be roughly divided into e cases in which: (1) real time data is not recorded the entire disc; (2) two types of data, i.e., real time a and non-real time data, coexist on a disc, and a ear replacement defect managing method is not used h respect to only the real time data; and (3) only the l time data is recorded in the entire disc, i.e., the lin- replacement defect managing method is not used h respect to all recorded data.

4] Particularly, in the third case, real time replace- nt is not used for the entire disc, so that a spare area defect management can be set to a smaller size than the first and second cases. This will be described in ail later referring to Figures 12 and 13.

5] When these three or more defect managing thods are applied to one disc, various correspond- ces are possible according to the purpose of use of disc, and the disc can be more effectively used. How- er, considering a condition such as the case of chang- and using discs between reproduction apparatuses, defect management conditions in which a corre- onding disc is used must be described in more detail. bit disc defect management mode information repre- nting use or non-use of linear replacement described in Figure 8 is deficient for defect management information in the above case.

[0096] Thus, as shown in Figure 11, defect management mode information capable of representing linear replacement or non-linear replacement depending on a plurality of different defect management modes is stored in a reserved byte located in the DDS of the defect management area (DMA) on a disc. That is, Figure 11 shows the case of using two significant bits b7 and b6 of the relative byte position BP10 of DDS, i.e., the eleventh byte thereof, by taking defect management (DM) mode depending on use or non-use of linear replacement as an example.

[0097] As shown in Figure 11, when the DM mode information is "00b", it indicates that the slipping replacement and the linear replacement are applied to all data on a disc, when the DM mode information is "01b", it indicates that the linear replacement is selectively applied according to the type of information (here, real time data and non-real time data), and when the DM mode information is "10b", it indicates that the linear replacement is not used with respect to every data.

[0098] That is, when the DM mode information is "00b", the slipping replacement and the linear replacement are mandatory, and this mode is only for data other than real time data in the first case described above. When the DM mode information is "01b", the linear replacement is mandatory, but the linear replacement for real time data is optional. This mode is defect management for a hybrid disc including both real time data and non-real time data in the second case described above. When the DM mode information is "10b", only the slipping replacement is allowable, and this mode is defect management for only real data in the third case described above. When the DM mode information is "10b", the physical layout of a disc can be changed.

[0099] Meanwhile, since linear replacement cannot be used to record real time data, a spare area necessary for linear replacement does not actually become necessary. For this case, in the present invention, only a spare area for slipping replacement is set in the last group without allocating a spare area for linear replacement as shown in Figure 12. In particular, the spare area set in the last group (here, a thirty fourth group) allocates 7680 sectors (480 ECC blocks) to a spare area for slipping replacement to process a maximum of 7679 entries capable of being registered in a primary defect list (PDL). In Figure 12, sect denotes a sector, blk denotes a block, and rev denotes revolutions.

[0100] In order to obtain the compatibility between the present invention and an existing defect management structure, a flag, capable of discriminating a case in which spare areas for only slipping replacement are allocated only for real time recording from a case in which spare areas for linear replacement and slipping replacement are allocated according to an existing defect management method, is represented with significant bits b7 and b6 of the relative byte position BP 10 in the DDS

the PDL, as shown in Figure 13.

01] As shown in Figure 13, when two significant b7 and b6 representing a DM mode on the byte po- n BP 10 of the DDS/PDL are "00b", it indicates that existing defect managing method is applied, and n the two significant bits b7 and b6 are "10b", a de- managing method for only real time recording with- linear replacement, in which only the spare area for ping replacement is allocated in the last group of a , is applied. Thus, spare areas are allocated by a thod dedicated for real time recording, thereby in- asing the efficiency due to the application of the ce of a disc.

02] As described above, while compatibility be- en a method of the present invention and a defect naging method based on the current DVD-RAM ndard is maintained, linear replacement is not per- med when real time data is recorded. Thus, real time a can be recorded and reproduced.

03] In embodiments of the present invention, infor- tion representing a plurality of different defect man- ement modes depending on the type of data to be orded is stored, so that various correspondences are ssible according to the purpose of use of the record- medium. Thus, the recording medium can be more actively used.

04] Also, in embodiments of the present invention, en real time data is recorded, spare areas are allo- ed to be used for only real time. Thus, the effective- ss due to the application of the space of a disc can increased.

05] The reader's attention is directed to all papers d documents which are filed concurrently with or pre- us to this specification in connection with this appli- tion and which are open to public inspection with this ecification, and the contents of all such papers and cuments are incorporated herein by reference.

06] All of the features disclosed in this specifica- n (including any accompanying claims, abstract and awings), and/or all of the steps of any method or proc- s so disclosed, may be combined in any combination, cept combinations where at least some of such fea- es and/or steps are mutually exclusive.

07] Each feature disclosed in this specification (in- ding any accompanying claims, abstract and draw- s), may be replaced by alternative features serving same, equivalent or similar purpose, unless ex- ssly stated otherwise. Thus, unless expressly stated erwise, each feature disclosed is one example only a generic series of equivalent or similar features.

08] The invention is not restricted to the details of foregoing embodiment(s). The invention extends to y novel one, or any novel combination, of the features closed in this specification (including any accompa- ng claims, abstract and drawings), or to any novel , or any novel combination, of the steps of any meth- or process so disclosed.

Claims

1. A recording medium including a recording area and a spare area, for storing information representing use or non-use of linear replacement defect management in which a defective area on the recording medium is replaced with the spare area.

2. The recording medium as claimed in claim 1, wherein the information representing use or non-use of linear replacement contains information associated with the entire recording medium.

3. The recording medium as claimed in claim 1, wherein the information representing use or non-use of linear replacement contains information associated with parts of the recording medium.

4. The recording medium as claimed in claim 1, 2 or 3, wherein the recording medium is a disc designated by a digital versatile disc (DVD) standard.

5. The recording medium as claimed in claim 1, 2 or 3, wherein the recording medium is a DVD-RAM disc designated by a DVD-RAM standard.

6. The recording medium as claimed in claim 1, 2, 3, 4 or 5, wherein the information representing use or non-use of linear replacement is recorded in a reserved area of a disc certification flag and a group certification flag in a disc definition structure (DDS) provided by the DVD-RAM.

7. The recording medium as claimed in any of claims 1 to 6, wherein the information representing use or non-use of linear replacement is stored upon initialization.

8. The recording medium as claimed in any of claims 1 to 6, wherein the information representing use or non-use of linear replacement is stored just before recording the real time data.

9. The recording medium as claimed in any of the preceding claims, wherein only the start sector number of a block having a defect generated while real time data is recorded on the recording medium is recorded in a secondary defect list (SDL). Information representing that the defective block has not been replaced is recorded in an FRM bit of an SDL entry for representing replacement or non-replacement of the defective block, and information representing non-replacement is recorded in the start sector number of a replacement block of the SDL entry.

10. The recording medium as claimed in claim 9, wherein information representing that linear replacement has been canceled is further stored in a reserved

bit of the SDL entry. Information representing that the defective block has been replaced is stored in the FRM bit of the SDL entry, and the start sector number of the defective block and that of the replacement block are stored in the SDL entry.

The recording medium as claimed in any of the preceding claims, wherein the information representing use or non-use of linear replacement includes information representing that linear replacement is applied with respect to every data on a recording medium, information representing that linear replacement is selectively applied according to the type of data, and information representing that linear replacement is not applied to every data on the recording medium, and this information is stored in the reserved area of the DDS.

The recording medium as claimed in any of the preceding claims, wherein when real time data is recorded, a spare area for linear replacement is not allocated, and only a spare area for slipping replacement is allocated.

The recording medium as claimed in claim 12, wherein the spare area for slipping replacement is allocated in the last group of the recording medium by the size of sectors capable of processing a maximum number of entries capable of registering a primary defect list (PDL).

The recording medium as claimed in claim 13, wherein information representing use or non-use of linear replacement, denoting use of a defect managing method for only real time recording in which linear replacement is not used by allocating only the spare area for slipping replacement, is stored in a reserved area of the DDS and the PDL.

A recording medium for storing defect management mode information for showing a plurality of defect management modes representing use or non-use of linear replacement according to the type of data to be recorded.

The recording medium as claimed in claim 15, wherein the defect management mode information is stored in a reserved area of the DDS of a defect management area (DMA).

The recording medium as claimed in claim 15 or 16, wherein the defect management mode information includes first defect management mode information representing that slipping replacement and linear replacement are applied to every data on the recording medium, second defect management mode information representing that linear replacement is selectively applied according to the type of data, and third defect management mode information representing that linear replacement is not applied to every data on the recording medium.

18. A recording medium for storing information representing non-application of linear replacement to all data on the recording medium in a defect management area, in which only a spare area for slipping replacement is allocated.

19. The recording medium as claimed in claim 18, wherein the defect management area is a reserved area in the DDS and the PDL, and the spare area for slipping replacement can process a maximum number of entries capable of registering the PDL.

20. A defect managing method for a disc recording and/or reproducing apparatus, comprising the steps of:

(a) recording information representing use or non-use of linear replacement defect management with respect to the entire disc or a specific area of a disc; and

(b) determining whether a defective area will be replaced by a block in a spare area using linear replacement according to information representing use or non-use of the linear replacement defect management.

21. The defect managing method as claimed in claim 20, wherein in step (a), information representing use or non-use of linear replacement for the entire disc is recorded in a reserved area of a disc certification flag in the DDS provided by the DVD-RAM.

22. The defect managing method as claimed in claim 20 or 21, wherein in step (a), information representing use or non-use of linear replacement for the specific area of the disc is recorded in a reserved area of a group certification flag in the DDS provided by the DVD-RAM.

23. The defect managing method as claimed in claim 20, 21 or 22, wherein in step (a), the information representing use or non-use of linear replacement is recorded upon initialization of the disc.

24. The defect managing method as claimed in any of claims 20 to 23 wherein in step (a), the information representing use or non-use of linear replacement is recorded just before real time data is recorded on the disc.

25. The defect managing method as claimed in any of claims 20 to 24, wherein the information representing use or non-use of linear replacement is information for showing a plurality of defect management

modes, and this information is recorded in a reserved area of the DDS.

25. The defect managing method as claimed in claim 25, wherein the information showing the plurality of defect management modes includes information representing that slipping replacement and linear replacement is applied with respect to all data on the recording medium, information representing that linear replacement is selectively applied according to the type of data, and information representing that linear replacement is not applied to all data on the recording medium.

27. The defect managing method as claimed in any of claims 20 to 26, wherein the information representing use or non-use of linear replacement denotes the use of a defect managing method dedicated for real time recording in which linear replacement is not performed by allocating only a spare area for slipping replacement.

28. The defect managing method as claimed in claim 27, wherein the spare area for slipping replacement is allocated to the last group of a disc, and the information representing use or non-use of linear replacement is recorded in the reserved area of the DDS and the PDL.

29. The defect managing method as claimed in any of claims 20 to 28, wherein in step (b), when the information representing use or non-use of linear replacement represents the non-use of linear replacement, linear replacement is not used for real time data, but linear replacement is used for data other than real time data.

30. The defect managing method as claimed in any of claims 20 to 28, wherein in step (b), when the information representing use or non-use of linear replacement represents the non-use of linear replacement, linear replacement is not used regardless of whether data is real time data.

31. The defect managing method as claimed in any of claims 20 to 30, further comprising the step of:

(c) cancelling the linear replacement of a defect on an area where real time data is to be recorded, when the information representing use or non-use of linear replacement represents the non-use of linear replacement.

32. The defect managing method as claimed in claim 31, wherein in step (c), the linear replacement is canceled using a flag representing that the linear replacement has been canceled using a reserved bit in an SDL, information representing that a defective block has been replaced is stored in an FRM bit of the SDL entry, and the start sector number of the defective block and the start sector number of a replacement block are stored in the SDL entry.

33. The defect managing method as claimed in claim 31, wherein in step (c), only the start sector number of a defective block is left in an SDL, information representing that a defective block has not been replaced is stored in an FRM bit of the SDL entry showing whether the defective block has been replaced, and information representing that the defective block has not been replaced is stored in the start sector number of a replacement block are stored in the SDL entry.

34. The defect managing method as claimed in any of claims 20 to 33, further comprising the step of:

(d) recording only the start sector number of a block having a defect generated while using a disc on which information that the linear replacement defect management will not be used has been recorded, in an SDL, recording information representing that a defective block has not been replaced in the FRM bit of the SDL entry showing whether the defective block has been replaced, and recording information that the defective block has not been replaced in the start sector number of a replacement block in the SDL entry.

35. The defect managing method as claimed in any of claims 20 to 34, further comprising the step of:

(e) performing defect management based on linear replacement when a defect is generated during use of a disc on which information that the linear replacement defect management will be used has been recorded.

36. A method of recording real time data while managing a defect on a disc using a disc recording and/or reproducing apparatus, the method comprising the steps of:

(a) determining whether defect management mode information representing whether defect management based on linear replacement will be used;

(b) determining whether data to be recorded is real time data, when the defect management mode information is information that the linear replacement will not be used;

(c) determining whether a linearly-replaced defect exists in an area to record data in, when

the data to be recorded is real time data; and

(d) determining whether a new defect is detected in the area to record data in, when no linearly-replaced defect exists in the area to record data in, and recording the real time data in a desired area when the new defect is not detected.

37. The method of recording real time data as claimed in claim 36, further comprising the steps of:

(e) performing defect management when the defect management mode information is information representing that the linear replacement will be used, in step (a); and

(f) performing defect management when data to be recorded is not real time data in step (b).

38. The method of recording real time data as claimed in claim 36 or 37, further comprising the step of:

(g) canceling linear replacement when a linearly-replaced defect exists in an area to record data in, in step (c).

39. The method as claimed in claim 38, wherein in step (g), only the start sector number of a defective block is left in the SDL, information representing that the defective block has not been replaced is stored in an FRM bit of the SDL entry showing whether the defective block has been replaced, and information representing that the defective block has not been replaced is recorded in the start sector number of a replacement block in the SDL entry.

40. The method as claimed in claim 38, wherein in step (g), a flag representing that linear replacement has been canceled is set using a reserved bit of the SDL entry, information representing that a defective block has been replaced is stored in an FRM bit of the SDL entry, and the start sector number of the defective block and the start sector number of a replacement block are recorded in the SDL entry.

41. The method of recording real time data as claimed in any of claims 36 to 40, further comprising the step of:

(h) recording information representing that linear replacement has not been performed, when a new defect is detected in step (d).

42. The method as claimed in claim 41, wherein in step (h), only the start sector number of a defective block is left in the SDL, information representing that the defective block has not been replaced is stored in an FRM bit of the SDL entry showing whether the defective block has been replaced, and information representing that the defective block has not been replaced is recorded in the start sector number of a replacement block in the SDL entry.

43. The method as claimed in any of claims 36 to 42, wherein the defect management mode information is information representing use or non-use of linear replacement for the entire disc, and is stored in a reserved area of a disc certification flag in a DDS provided by DVD-RAM.

44. The method as claimed in any of claims 36 to 42, wherein the defect management mode information is information representing use or non-use of linear replacement for some data groups of the disc, and is stored in a reserved area of a group certification flag in a DDS provided by DVD-RAM.

45. The method as claimed in any of claims 36 to 44, wherein the defect management mode information includes information representing that slipping replacement and linear replacement are applied to all data on a disc, information representing that linear replacement is selectively applied according to the type of data, and information representing that linear replacement is not applied to all data on the disc, and this information is stored in a reserved area of a DDS provided by DVD-RAM.

46. The method as claimed in any of claims 36 to 45, wherein the defect management mode information is information representing the use of a defect managing method for only real time recording in which linear replacement is not used by allocating only the spare area for slipping replacement, and is stored in a reserved area of a DDS provided by DVD-RAM and the PDL.

FIG. 1

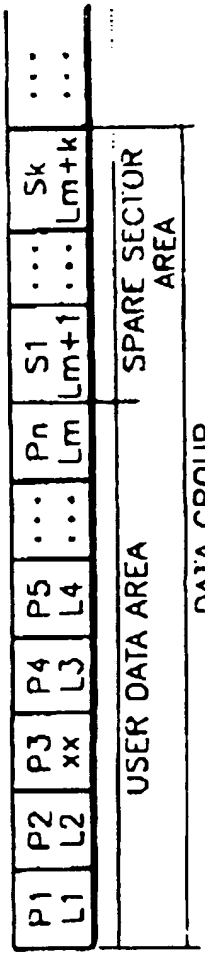

P1 L1
P2 L2
P3 xx
P4 L3
P5 L4
...
Pn Lm
S1 Lm+1
...
Sk Lm+k
...
USER DATA AREA
SPARE SECTOR AREA
DATA GROUP

FIG. 2

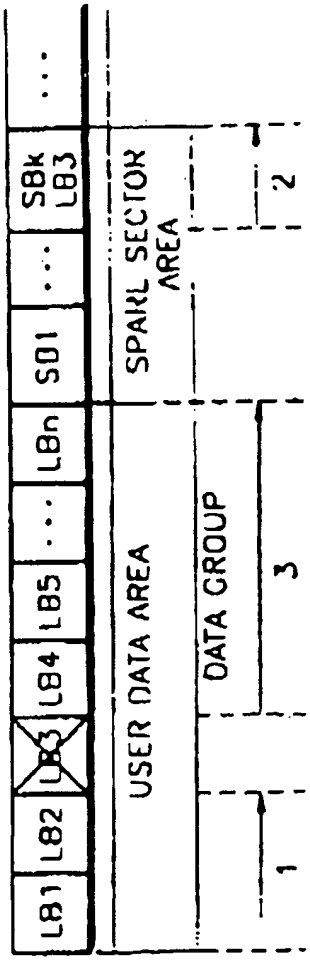

LB1
LB2
LB3
LB4
LB5
...
LBn
SB1
...
SBk LB3
...
USER DATA AREA
SPARE SECTOR AREA
DATA GROUP
1
2
3

FIG. 3

BP	Contents	Number of bytes
0 to 1	DDS Identifier(DA0Ah)	2bytes
2	Reserved	1bytes
3	Disc certification flag	1bytes
4 to 7	DDS/PDL, update counter	4bytes
8 to 9	Number of Groups	2bytes
10 to 15	Reserved	6bytes
16	Group certification for Group0	
17	Group certification for Group1	
. . .	. . .	
39	Group certification for Group23	64bytes
40 to 79	Reserved	
80 to 2047	Reserved	1968bytes

FIG. 4A

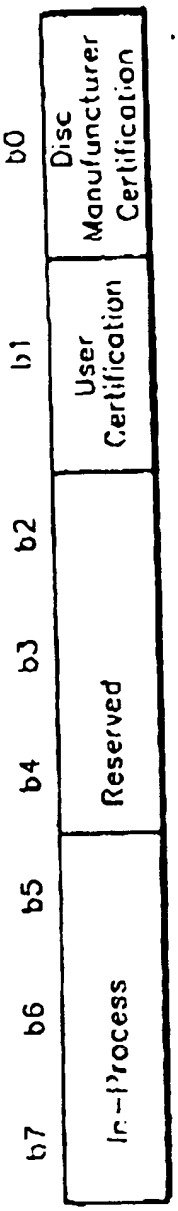

b0
b1
b2
b3
b4
b5
b6
b7
Disc Manufacturer Certification
User Certification
Reserved
In-Process

FIG. 4B

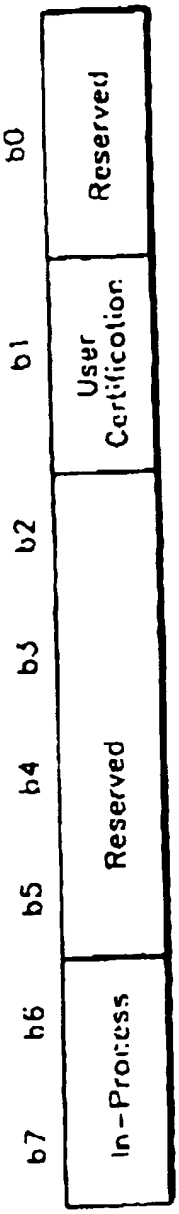

b0
b1
b2
b3
b4
b5
b6
b7
Reserved
User Certification
Reserved
In-Process

FIG. 5

BP	Contents	Number of bytes
0 to 1	SDL identifier(0002h)	2bytes
2 to 3	Reserved	2bytes
4 to 7	SDL update counter	4bytes
8 to 15	Spare area full flag	8bytes
16 to 19	DDS/PDL update counter	4bytes
20 to 21	Reserved	2bytes
22 to 23	number of SDL entries	2bytes
24 to 31	first SDL entry	8bytes
. . .	. . .	. . .
m to m+7	last SDL entry	8bytes

FIG. 6

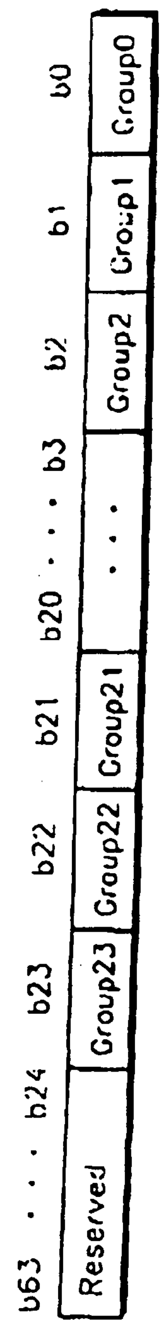

b63 . . . . b24
b23
b22
b21
b20 . . . . b3
b2
b1
b0
Reserved
Group23
Group22
Group21
. . .
Group2
Group1
Group0

FIG. 7

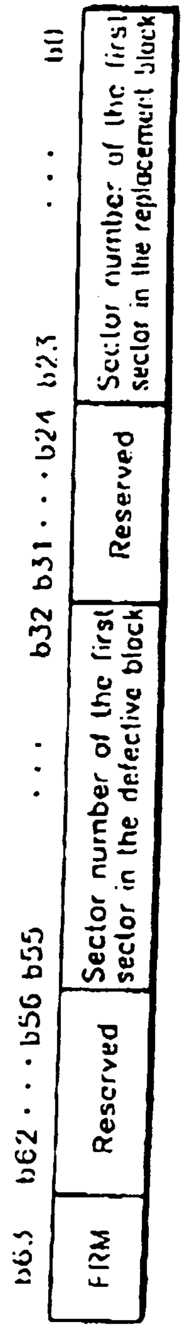

b63
b62 . . . b56
b55
. . .
b32
b31 . . . b24
b23
. . .
b0
FRM
Reserved
Sector number of the first sector in the defective block
Reserved
Sector number of the first sector in the replacement block

FIG. 8A

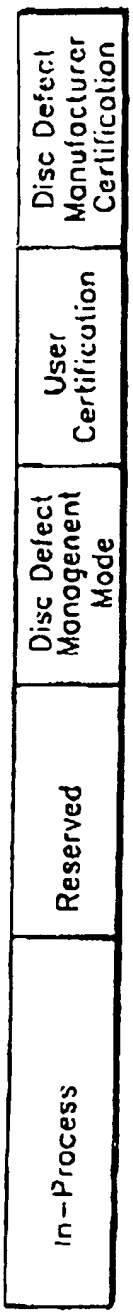

b7
b6
b5
b4
b3
b2
b1
b0
In-Process
Reserved
Disc Defect Managenent Mode
User Certification
Disc Defect Manufacturer Certification

FIG. 8B

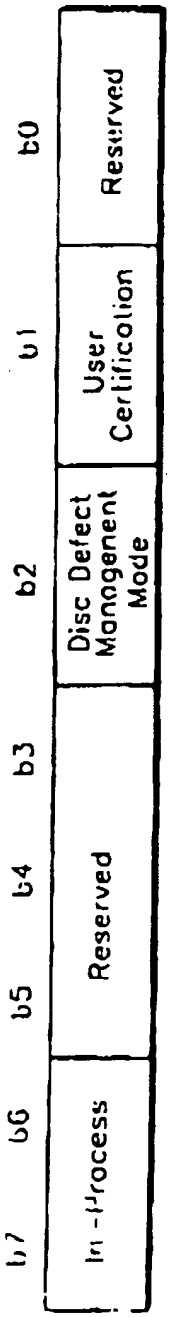

b7
b6
b5
b4
b3
b2
b1
b0
In-Process
Reserved
Disc Defect Managenent Mode
User Certification
Reserved

FIG. 9

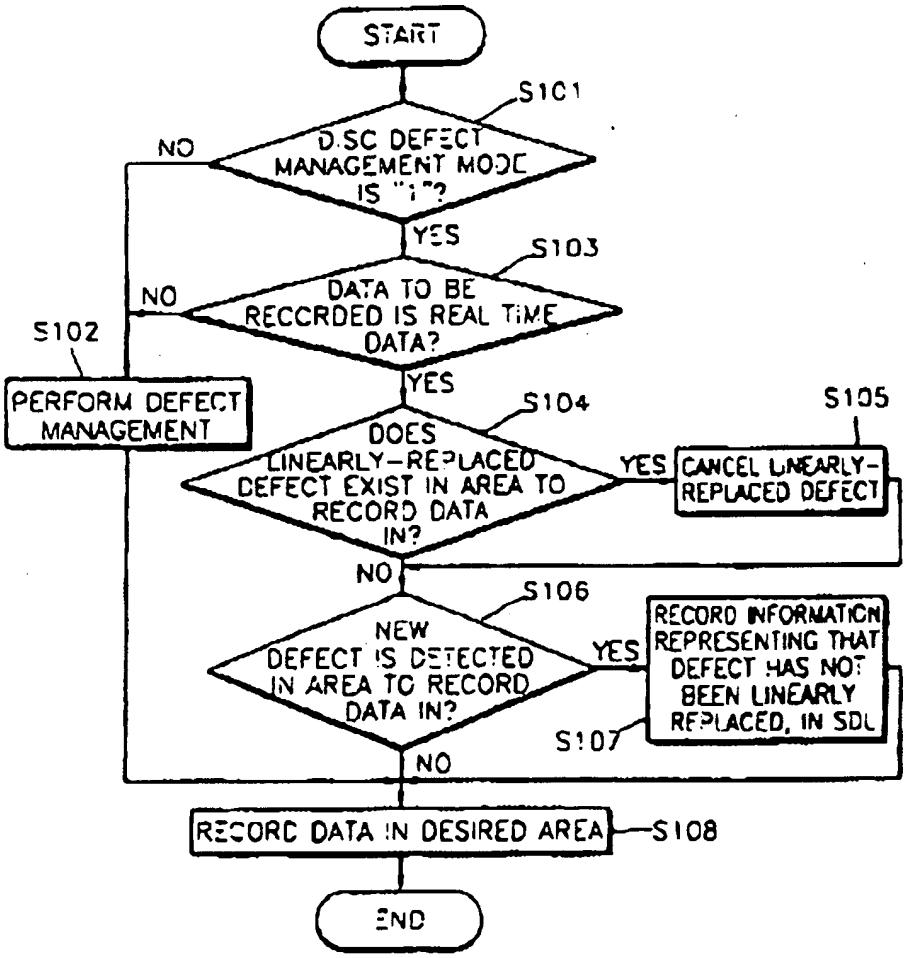

START
S101
DISC DEFECT MANAGEMENT MODE IS "1"?
NO
YES
S103
DATA TO BE RECORDED IS REAL TIME DATA?
NO
S102
YES
PERFORM DEFECT MANAGEMENT
S104
DOES LINEARLY-REPLACED DEFECT EXIST IN AREA TO RECORD DATA IN?
YES
S105
CANCEL LINEARLY-REPLACED DEFECT
NO
S106
NEW DEFECT IS DETECTED IN AREA TO RECORD DATA IN?
YES
RECORD INFORMATION REPRESENTING THAT DEFECT HAS NOT BEEN LINEARLY REPLACED, IN SDL
S107
NO
RECORD DATA IN DESIRED AREA
S108
END

FIG. 10

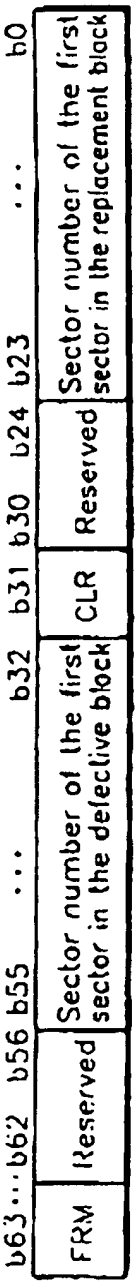

b63...b62
FRM
b56 b55
Reserved
...
b32
Sector number of the first sector in the defective block
b31 b30
CLR
b24 b23
Reserved
...
b0
Sector number of the first sector in the replacement block

FIG. 11

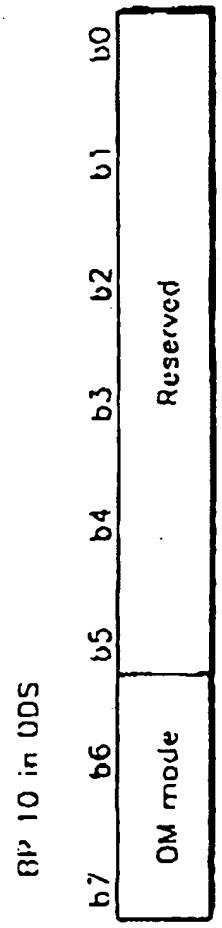
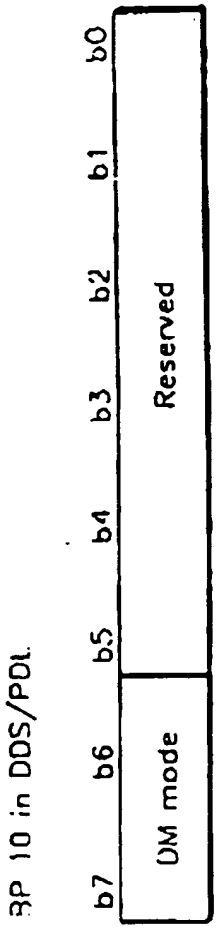

BP 10 in ODS
b7 b6 b5 b4 b3 b2 b1 b0
OM mode
Reserved

FIG. 12

Zone	# of sectors per track	Start Sector Number (PSN)	Guard Area	# of Guard trk	Group No.	User Area		Spare area		Guard Area	End sector number
						Sector number	# of trk	Sector number	# of trk		
0	25	31000	-	0	0	31000 - 398DF	2100	-	0	398E0 - 3991F	3991F
1	26	39D00	39920 - 3995F	4	1	39960 - 4381F	2540	-	0	43820 - 4386F	4386F
2	27	441F0	43870 - 4389F	4	2	438A0 - 4DD7F	2636	-	0	4DD80 - 4DDBF	4DDBF
3	28	4EC60	4DDC0 - 4DDFF	4	3	4DE00 - 5B8FF	2738	-	0	5B900 - 5B93F	5B93F
4	29	59D20	5B940 - 5B97F	4	4	5B980 - 63A9F	2834	-	0	63AA0 - 63ADF	63ADF
5	30	65120	63AE0 - 63B1F	4	5	63B20 - 6F25F	2937	-	0	6F260 - 6F29F	6F29F
6	31	71190	6F2A0 - 6F2DF	4	6	6F2E0 - 7B03F	3030	-	0	7B040 - 7B07F	7B07F
7	32	7D540	7B080 - 7B0BF	4	7	7B0C0 - 8743F	3128	-	0	87440 - 8747F	8747F
8	33	89F40	87480 - 874CF	5	8	874D0 - 93E4F	3224	-	0	93E50 - 93E9F	93E9F
9	34	96F80	93EA0 - 93EEF	5	9	93EF0 - A0E8F	3329	-	0	A0E90 - A0EDF	A0EDF
10	35	A4630	A0EE0 - A0F2F	5	10	A0F30 - AE4EF	3420	-	0	AE4F0 - AE53F	AE53F
11	36	B2320	AE540 - AE58F	5	11	AE590 - BC16F	3516	-	0	BC170 - BC1BF	BC1BF
12	37	C0660	BC1C0 - BC20F	5	12	BC210 - CA40F	3616	-	0	CA410 - CA45F	CA45F
13	38	CEFF0	CA460 - CA4AF	5	13	CA4B0 - D8CCF	3714	-	0	D8CD0 - D8D1F	D8D1F
14	39	DDFD0	D8D20 - D8D6F	5	14	D8D70 - E78AF	3812	-	0	E78B0 - E78FF	E78FF
15	40	ED600	E7900 - E794F	5	15	E7950 - F70AF	3910	-	0	F70B0 - F70FF	F70FF
16	41	FD780	F7100 - F715F	6	16	F7160 - 106BBF	4006		0	106BC0 - 106C1F	106C1F
17	42	10D830	106C20 - 106C7F	6	17	106C80 - 115FDF	4104	-	0	115FE0 - 11603F	11603F
18	43	11DE70	116040 - 11609F	6	18	1160A0 - 12745F	4202	-	0	127460 - 1274BF	1274BF
19	44	12ED60	1274C0 - 12751F	6	19	127520 - 13910F	4300	-	0	139120 - 13917F	13917F
20	45	1400A0	139180 - 1391DF	6	20	1391E0 - 14957F	4398	-	0	149580 - 1495DF	1495DF
21	46	161F80	1495E0 - 14963F	6	21	149640 - 15AF3F	4496	-	0	15AF40 - 15AF9F	15AF9F
22	47	164910	15AFA0 - 15AFFF	6	22	15B000 - 16CF1F	4594	-	0	16CF20 - 16CF7F	16CF7F
23	48	178A00	16CF80 - 16CFDF	6	23	16CFE0 - 17F51F	4689	-	0	17F520 - 17F57F	17F57F
24	49	1898C0	17F580 - 17F5EF	7	24	17F5F0 - 19212F	4788	-	0	192130 - 19219F	19219F
25	50	19CF10	1921A0 - 19220F	7	25	192210 - 1A536F	4886	-	0	1A5370 - 1A53DF	1A53DF
26	51	1B0AB0	1A53E0 - 1A544F	7	26	1A5460 - 1B8BCF	4984	-	0	1B8BD0 - 1B8C3F	1B8C3F
27	52	1C4CA8	1B8C40 - 1B8CAF	7	27	1B8CB0 - 1CCA4F	5080		0	1CCA50 - 1CCABF	1CCABF
28	53	1D9420	1CCAC0 - 1CCB2F	7	28	1CCB30 - 1E0EEF	5180	-	0	1E0EF0 - 1E0F5F	1E0F5F
29	54	1E6370	1E0F60 - 1E0FCF	7	29	1E0FD0 - 1F59AF	5278	-	0	1F59B0 - 1F5A1F	1F5A1F
30	55	203850	1F5A20 - 1F5A8F	7	30	1F5A90 - 20AA8F	5376	-	0	20AA90 - 20AAFF	20AAFF
31	56	217380	20AB00 - 20AB6F	7	31	20AB70 - 22018F	5474		0	220190 - 2201FF	2201FF
32	57	22F800	220200 - 22027F	8	32	220280 - 235E9F	5570	-	0	235EA0 - 235F1F	235F1F
33	58	241C00	235F20 - 235F9F	8	33	235FA0 - 24C1DF	[illegible]		0	24C1E0 - 24C25F	24C25F
34	59	25CAF0	24C260 - 24C2DF	8	34	24C2E0 - [illegible]	5684	[illegible] - [illegible]	180	-	[illegible]

2937 P02 三菱電機 映像システム開発研究所 075(958)3703 7121 00/05/10 10:30 REC'D #002
MAY-10-2000 02:14 03 3378 3303 93% P.24

FIG. 13



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